Epidemiology of toxoplasmosis diagnosis.

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Abstract

Toxoplasma gondii is an apicomplexan parasite that was only recently identified, but in the past 40 years, we have learned more about its biological life cycle and the significance of this parasite in terms of medicine. This obligate intracellular parasite was first discovered as a pathogen causing congenital infection, but it wasn't until later, in the era of organ transplantation and HIV infection, that it's clinical manifestation and the significance of infections reactivating in immunocompromised patients were understood. Recent advances in our understanding of host cell-parasite interactions and parasite virulence have opened up new perspectives on the pathophysiology of infection. We concentrate on epidemiological and diagnostic issues in this review, putting them in context with our current understanding of parasite genotypes.

Keywords: HIV, Toxoplasma, Parasite, Genotype, Intracellular.

Introduction

The protozoan parasite Toxoplasma gondii is present on every continent. This obligate intracellular parasite can infect almost any warm-blooded animal, including mammals, birds, and people. Since Nicolle and Manceaux originally identified the parasite in the gondi, a rodent native to North Africa, in 1908, it has gradually come to be understood that it is the cause of a widespread zoonosis. However, it wasn't until the late 1960s that the complete life cycle of this parasite was finally identified. This was thanks to the identification of the cat as the key host that harbours the sexual parasitic cycle and disperses oocysts through faeces. The infectivity of the three parasitic stages was well defined at the same time, and it was assigned to the coccidian subdivision of the phylum Apicomplexa [1].

Biology of the parasite

T. gondii has three infectious stages: an invasive tachyzoite that divides quickly, a bradyzoite that divides slowly in tissue cysts, and an environmental stage called a sporozoite that is shielded inside an oocyst. These infectious stages are crescent-shaped cells with a pointed apical end and a rounded posterior end, measuring roughly 5 m long and 2 m wide [2]. They are constrained by the pellicle, a complex membrane that is closely related to the cytoskeleton and plays a role in the structural stability and motility of the cell. They have a nucleus, a mitochondrion, a Golgi complex, ribosomes, an endoplasmic reticulum, and an organelle resembling a plastid called an apicoplast that is bound to multiple membranes. This organelle may have been acquired by the parasite through a secondary endosymbiosis with a free-living red alga [3].

Life cycle of T. gondii

T. gondii is a tissue-cyst-forming coccidium that interacts with both final and intermediate hosts in the prey-predator cycle. It stands out from the others in this class because it can spread not only between intermediate and definitive hosts but also *via* carnivory between intermediate hosts or even between definitive hosts. The components of the sexual and asexual cycles and transmission dynamics vary depending on the physical traits and the structures of both the intermediate and definitive host populations in a given environment [4].

Mechanism of cell invasion

T. gondii is exceptional in its capacity to infiltrate a broad range of host cells. The parasite's ability to move and the orderly production of proteins from secretory organelles including micronemes, rhoptries, and dense granules are both essential for invasion. Invasion requires attachment to the host cell membrane. It necessitates the calcium-dependent production of adhesins from micronemes, such as the microneme protein MIC2, that bind to receptors on host cell membranes and facilitate parasite reorientation and attachment. Gliding motility, a sophisticated linear motor system aided by actin-myosin interactions, and dynamic rearrangements of the parasite cytoskeleton are all necessary for cell invasion. Cell invasion depends on this delicate interplay between the host cell surface and the parasite.

Methods for screening

Serological assays are mostly used to identify chronic *T. gondii* infection in animals. There is no industry-accepted gold standard test for identifying the many different Toxoplasma host species. Because reference sera from

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experimentally infected animals aren't available, cutoff values are challenging to determine. The sensitivity and specificity of the procedures depend on the animal species. Even when these sera are available for a single species, they might not accurately represent natural conditions because experimental animals are frequently exposed to large doses of the disease and occasionally through artificial means, which may result in overly high antibody titers. Although unique enzyme-linked immunosorbent assays have been developed for some domestic animals, the modified agglutination test currently appears to be the test that is most suited to a wide variety of species [5].

Breeding influences the distinctions in meat-producing animals

The use of intensive farm management with adequate hygiene and confinement measures, such as keeping meat-producing animals indoors throughout their lives, keeping the sheds free of rodents, birds, and cats, and feeding meat-producing animals on sterilised food, has significantly decreased the risk of Toxoplasma infection in livestock. As a result, the prevalence of *T. gondii* in pork has significantly decreased. In most industrialised nations, the seroprevalence in slaughter pigs is currently less than 5%. Only 0.57% of pork samples tested positive for *T. gondii* in a 2005 nationwide assessment of meat from retail outlets in the United States.

Infection frequency in humans

Toxoplasma infection affects between 25 to 30 percent of people worldwide, according to common consensus. Actually, prevalence rates varies significantly between nations and frequently within a single nation, as well as between various populations in the same location. North America, South East Asia, Northern Europe, and the Sahelian countries of Africa have all had low seroprevalences. Countries in Central and Southern Europe have moderate prevalences, while those in Latin America and tropical African nations have high prevalences.

Conclusion

In the last 20 years, there have been significant developments in the study of toxoplasma. The advancement of novel imaging methods, high-throughput genomic and proteomic technologies, and molecular and cell biology fundamental studies have all benefited. In order to highlight these advancements, another review will be required. Epidemiological research, however, also gained prominence over time. Environmental study has been sparked by the advent of Toxoplasma as a waterborne illness in various nations. For a better understanding of the intricate exchange of Toxoplasma between its various hosts and the environment, as well as the risk factors for human infection, an ecological and integrated approach was created. The diversity of *T. gondii* was discovered as a result of the isolation and genotyping of strains from numerous animal species on several continents.

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